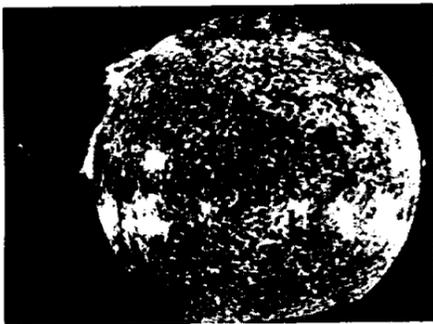


## Of men and machines

# The Skylab Saga: New problems arise

Flight controllers here were back in the active mode beginning on Monday, July 10, trying to return the space station Skylab to an even keel once again. In the early morning hours on Sunday, July 9, the vehicle's electrical power distribution system and all equipment connected to it autodisconnected due to an energy imbalance. In simple terms, the vehicle's power supply was unable to provide sufficient power for the equipment it was operating.

The sequence of events leading up to this began Friday, June 30, when power conditioning group (which includes a battery, charger and voltage regulator) number one failed. That was not in itself bad. There are eight PCG's in the airlock module and 10 usable CBRM's (charger,



THE SUN is shown showing off. Sunspot activity has been predicted to approach the highest levels ever this cycle.

battery, regulator module) in the Apollo Telescope Mount. These two systems provide electric power for Skylab.

### Second PCG Down

On Saturday, July 8, a second PCG, number five, failed. Due to the duplicate failure of identical equipment within a short time period, Houston flight controllers and Marshall engineers concurred on a plan which would bypass the power conditioning group chargers and batteries until the problem was understood.

This meant that during the daylight cycle, Skylab power would come from the solar wing direct and from the ATM CBRM's, bypassing the PCG's. During the night cycle, power would come from the ATM batteries, which showed none of the symptoms of airlock module PCG's.

### Scheme Fails

This scheme appeared to be working as flight controllers monitored the vehicle's performance throughout Saturday. Early Sunday, through, two CBRM's disconnected from the power buss because they were approaching the battery low-voltage cutoff point. This meant there were eight CBRM's supplying power during the night cycle.

Because of the geometry of the tracking station locations (Goldstone, Bermuda, and Madrid) site passes were insufficient for controllers to monitor the system completely and at the end of a three-hour Loss-of-Signal period, controllers found the vehicle unpowered. The eight remaining CBRM's had automatically cut out as they approached the low-voltage cutoff point.

At the time of the power failure, the vehicle was drawing minimum electricity

from the CBRM's. The computer, the control moment gyros, some instrumentation equipment, and a transmitter were on.

When the power failed, the gyros began spinning down, and the navigation program in computer memory was lost.

### Batteries Saved

Because the power work-around scheme involved isolating the PCG batteries, they remained fully charged. On Monday flight controllers used power from those batteries to activate receivers and transmitters so the CBRM chargers could be commanded on.

Because the gyros were shut down, the vehicle drifted out of the end-on velocity vector (or minimum drag) attitude, resulting in only periodic sun on the solar panels. It took three days for the CBRM batteries to reach full charge.

With the navigation program erased and the state vector lost, controllers were back to trying to deduce from solar panel shadowing and internal temperatures the attitude rates and direction of the vehicle.

On Wednesday, flight controllers and engineers began a set of cautious procedures aimed at returning the wobbling spacecraft to a solar inertial attitude. The day started with an early morning pass

over the Madrid tracking station. The procedures established for the day's activities allowed a 14-station-pass block of time to be devoted to watching the vehicle as it rolled and wobbled in its orbit, waiting for the opportune time to command attitude hold.

The vehicle has two sun sensors which indicate the position of the sun in the X and Y axes to within 20 degrees of solar inertial. By waiting for both sensors to indicate sun presence, flight controllers and Marshall engineers estimated the amount of thruster fuel used during the attitude hold and solar inertial maneuvers would be minimized.

The patience paid off at 1:25 p.m. when all necessary conditions were met and the vehicle was commanded into attitude hold using the nitrogen thruster system. The maneuver used 565 pound seconds of fuel.

At Roundup press time the vehicle was in a controlled attitude with electric power in good shape. The schedule for the remainder of Wednesday included placing the vehicle in solar inertial under gyro control.

Flight controllers were to have replaced the Skylab into the End-on Velocity Vector, or minimum drag, attitude by late yesterday.

## China aims to catch West in space science

Dr. Thornton Page and his wife were recently in the People's Republic of China on a friendship tour. Because of Dr. Page's work on the Extreme Ultraviolet camera during the Apollo missions and his interest in astronomy, he asked for and received tours of Chinese Astronomical facilities and audiences with several Chinese astronomers. The following is a personal report which Dr. Page prepared. We think you'll find the contents interesting.

By Dr. Thornton Page

Since April 1970, the Chinese have launched eight satellites into Earth orbit. So when I arrived in Peking with a Friendship tour on June 4th, I asked to meet with astronomers and space scientists there. I had brought with me copies of NRL Report 8173, "S201 Catalog of Far-Ultraviolet Objects", based on an Apollo 16 experiment, and several reprints, NASA photos and pamphlets, and a book "Space Science and Astronomy" that summarizes much of our space program through 1976. This gambit worked well, and I met with scientists from the Academia Sinica (their national academy of science) and the Peking Observatory on June 7th and June 13th.

Each of these meetings started with formal introductions: I was introduced by our tour guide-interpreter, and the Chinese were introduced by their senior man, who spoke English and described each man's special interest. These included the motions of stars in galaxies, x-ray detectors, the Earth's airglow, double

(Continued on page 4)

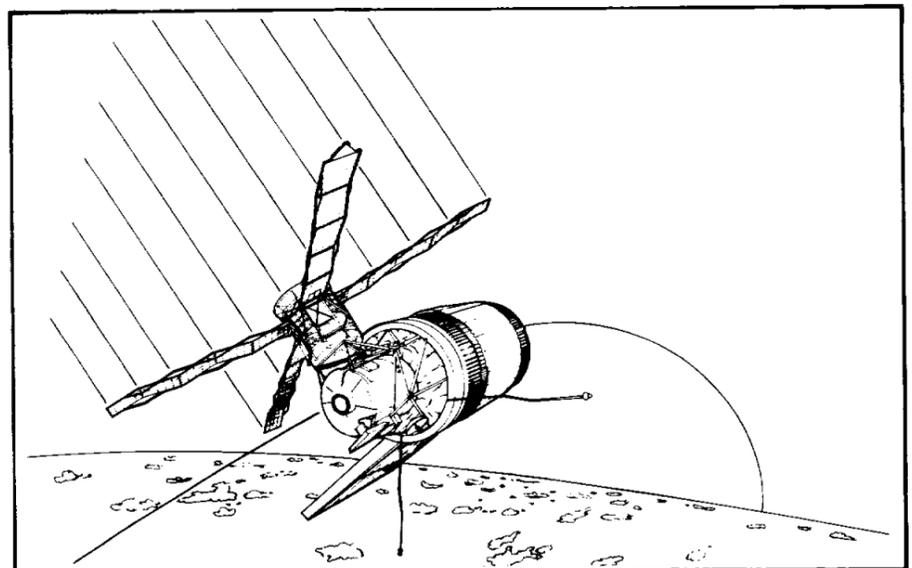


Dr. Thornton Page

## Your heart cares, too

The relationship between nutrition and cardiovascular health is a topic that is currently receiving a great deal of attention. To learn some interesting facts about how your eating habits can affect your cardiovascular system as well as controlling weight and cholesterol through a proper dietary program, plan to attend the JSC Health Education Program on Tuesday, July 25, at 9:00 a.m. or 1:00 p.m. (two sessions) in the Building 30 auditorium.

The JSC Clinic in cooperation with a Registered Dietitian, Mrs. Barbara Koybayashi from the Kelsey-Seybold Main Clinic, will conduct these informative sessions.



THE SKYLAB is depicted here in the End-On Velocity Vector (EOVV) or minimum drag orbital position. The vehicle's front end flies in the direction of the orbit and the solar panels continue to face the sun. Preliminary observations taken during the past six weeks indicate that the EOVV attitude cuts the drag factor on the vehicle to less than half what it is without EOVV. The key, of course, is maintaining the vehicle in the minimum drag position.

## Skylab network to expand; Santiago station to aid effort

The Santiago, Chile, Spacecraft Tracking and Data Network (STDN) station will be added to the Skylab tracking network which currently includes Goldstone, California, Bermuda, and Madrid, Spain.

The Santiago station will need new equipment to do this which will be installed within the next 4 to 8 weeks. This equipment includes a VHF antenna, receiver and transmitter systems, and the computer command equipment.

The Santiago station will fill an approximate 6 to 7 hour gap which presently exists each 24 hours in the Skylab station coverage. With the addition of Santiago, station passes will be spaced throughout the 24 hours of each day.

The control center at Houston will add the capability to process Apollo Telescope Mount (ATM) dump-data. This

involves the addition of software to presently-used computing systems.

The staffing for the Skylab activation will be increased to 3 shifts a day, 7 days a week.

### Engines test okay in 4th trial run

Orbiter main engine test fire number four went off as scheduled on July 7. The engines were started at 70% thrust. Two engines were cycled up to 90%, down again to 70% and up to 90%. This third engine was left at 70% simulating a stuck thruster. Shutdown occurred at 100 seconds for the two at 90%. The third engine was shut down at 95 seconds.

## Roundup Sports

### Skeet Shooters Announce New League Start Date

The spring JSC skeet league has nearly finished. Final place standings were known on Thursday, July 20, but



David Rhodes  
"Most Improved"

were too late for inclusion in this issue. However, David Rhodes, LEC, received the "Most-improved" shooter award.

The league shoots at the Clear Creek Gun Range, League City, and is forming a new league for summer beginning August 3. Persons interested in joining are invited to contact the range directly at 337-1722. The fee is \$5, with \$2 going for administrative costs and \$3 held back for awards. The fee will be collected the first night of competition, Thursday, Aug. 3.

The teams are limited to five persons. Individuals or teams may join. The shooting competition is every Thursday evening during two periods: 6:00 p.m. and again at 7:30 p.m. Teams will alternate times.

The range is open from 2:00 p.m. to 10:00 p.m. Monday through Friday and from 9:00 a.m. to 10:00 p.m. on weekends.

The league awards trophies in five categories: First, Second, and Third place awards for teams, Most Improved individual shooter, and High Overall Score for an individual shooter.

### JSC GA Tourney Scores

The fairways were narrow, the rough long, the trees thick, and there was enough sand to make them think they had gone to the "Gobi Desert." Pin placement was invariably behind the traps.

On July 8, Group I of the Golf Association played Newport Country Club with varying degrees of success. Scores were

more divergent than any other tournament to date. One foursome, reporting in an hour after the group in front of them, said they spent the entire day in the woods looking for lost balls.

Winners, who must have played good position golf, were Jake Klinar, net 69; George Duncan, 70; Bill Shropshire, 73; and John Lee, 74.



Shown here victorious are (l to r) George Duncan, Bill Shropshire, and John Lee.

### Slow Pitch Tourney set

JSC teams may be eligible to participate in two men's slow pitch softball tournaments being sponsored at the Gilruth Recreation Facility.

The first is a Federal Business Association Tournament open to civil service employee teams on August 26 and 27. The second is a Houston-Galveston Area Industrial Recreation Council Tournament being held on September 15-16, 1978. This is for teams representing HGAIRC member companies. NASA teams must be 100% civil servants. Additional NASA area HGAIRC members eligible to enter their own teams are: MDAC, LEC, G.E., Singer, Rockwell and Hamilton Standard.

Both tournaments are double elimination. Entry fees are \$45.00. The sign-up deadlines are Thursday, August 17th and Thursday, September 7th respectively. Rosters are available at the Recreation Center.

### Volleyball Rosters Due

A 10 week long men's volleyball season and a 10 week women's season start the week of August 21, 1978. Team captains have until 5 p.m. August 8, 1978 to turn in completed rosters and entry fees. All participants must be NASA civil service or contractor employees. In addition, spouses and dependents 14 yrs. and over may participate. Team entry fee is \$70.00.

Teams with 100% 1978-79 EAA membership are eligible for a \$35 EAA subsidy, and will pay only a \$35.00 team entry fee. All other teams must pay the \$70.00 fee. Both the men's and women's leagues will be divided into A and B divisions according to levels of proficiency.

### Skydivers take note

There is a Skydiving outing being planned for the weekend of July 28. The outing will be primarily for those who have not yet parachuted, but those who have are also welcome.

For first jumpers, the price will be about \$50.00, and will include the training, equipment rental (except boots), and your first jump. However, if the turn out is large enough, this price will go lower.

For second, third, fourth, . . . etc., jumpers, the cost will vary according with your experience, and will be somewhere between \$35.00 and \$10.00.

If you are interested, or need more information, contact Greg Vrabel at extension 2651.

## EAA Attractions

### Special notice

The 13th annual Lunar Rendezvous Festival Antique Show will be held July 21 through 23 at the Clear Lake High School. Hours are 12:00 pm to 9:00 pm Friday and Saturday and 12:00 pm to 6:00 pm on Sunday. Antiques and other collectibles will be offered by over 40 dealers in a lively atmosphere of music and costume. The show benefits the Bay Area Museum.

### Alley theater subscriptions

The Alley Theater Corporate Subscription program is again being offered to NASA and contractor employees. Season tickets are available for next year's five performances at a low price of \$24.50, which may be charged on a variety of credit cards.

See your EAA representative for an Alley Theater brochure which will explain the program. The brochure contains an order form for subscriptions.

If you are planning to subscribe, fill out the form, enclose a check payable to Alley Theater or indicate a charge plan on the form and send to Doris Wood, EM (X-2831).

Corporate Subscription coupon books will be home-mailed just prior to the opening of the 78-79 season in October.

### Defensive Driving

By popular demand, the EAA will be offering another defensive driving course. This course is scheduled for August 14-17, 1978 from 6-10 p.m. at the Gilruth Center. The classes are two four-hour sessions; Mon. - Wed., or Tues. - Thurs., in room 204. The cost for the course is \$8.00 per person. The course is conducted by the College of the Mainland in cooperation with the Red Cross. Only 70 can be accommodated. Registration to be held on August 7 from 11:00 a.m. to 1:00 p.m., in the Lobby of the Rec Center.

### Classes

Sign-up in person at the Gilruth Recreation Center. Payment is due upon registration and is non-refundable. Call X3594 for further information. Summer classes are as follows:

Auto Mechanics, Intermediate-Review, Carburetor or Brakes and Shocks, Deadline, August 2, Class-August 9, \$19.00.

Auto Mechanics, Intermediate-Review, Minor Tune-Up, Deadline, August 2, Class-August 16, \$12.00.

Auto Mechanics, Basic, Deadline, August 30, Classes-September 6, 13, 20, 27, Lab-September 23, \$24.00.

Auto Mechanics, Intermediate, Deadline, October 4, Classes-October 11, 18, 25, November 1, Labs-October 21, 28, \$45.00.

Group Tennis, Deadline, July 26, Classes-July 31, August 2, 7, 9, 14, 16, 21, 23, Beginners 7:30-8:30, Intermediate 8:30-9:30, \$30.00.

### Building 11 ticket sales

Astroworld - \$7 (reg. \$8.50) available all season.

Six Flags Over Texas - \$6.75 (reg. \$8.50) available all season.

Disney Magic Kingdom Cards - Free; good for discounts on rides at Disneyland and Disneyworld, and lodging at selected hotels and motels.

Funseekers cards - Free, good for discounts on entrance to Astroworld and all Six Flags and lodging at selected hotels and motels.

Dean Goss Dinner Theatre — \$16 couple, \$8 single, good any night except Saturday.

Fun-Time Card — FREE — good for \$1 discount at Sea-Arama Marineworld.

The *Roundup* is an official publication of the National Aeronautics and Space Administration Lyndon B. Johnson Space Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for JSC employees.

### More Swap Shop . . .

(Continued from page 3)

Spinnaker pole, 2" dia. by 10', piston fittings, \$30. Sink s.s. 10' by 14", \$5. Clay Rathbun, 488-3319

Learn to Swim! 3 years and up — beginners thru stroke lessons, private pool in Friendswood. Experienced water safety instructor. Jannet, 482-5723 or Holly at 482-3637

Radio Shack TRS-80 Computer 4K RAM, CRT, Tape I/O, complete, \$495. M. Carson X-4336 or 946-0319

### Lost & Found

Found: Ladies watch, bldg. 45 parking lot. Claim in Rm. 436, Bldg. 45, Hydrick, X-6491

## What's cookin' in the JSC cafeteria

### Week of July 24

MONDAY: Cream of Celery Soup; Braised Beef Ribs; Chicken a la King; Enchiladas w/chili; Italian Cutlet (Special); Brussel Sprouts, Navy Beans. Standard Daily Items: Roast Beef; Baked Ham; Fried Chicken; Fried Fish; Chopped Sirloin; Selection of Salads, Sandwiches and Pies

TUESDAY: Seafood Gumbo; Turkey & Dressing; Country Style Steak; Beef Ravioli; Stuffed Cabbage (Special); Corn Cobette; Okra & Tomatoes; French Beans.

WEDNESDAY: Beef & Barley Soup; Catfish w/hush puppies; Roast Pork w/ dressing; 8 oz T-Bone Steak; BBQ Plate; Chinese Pepper Steak (Special); Broccoli; Macaroni w/cheese; Stewed Tomatoes.

THURSDAY: Cream of Tomato Soup; Beef Tacos; BBQ Ham Slice; Hungarian Goulash; Chicken Fried Steak (Special); Spinach, Pinto Beans, Beets.

FRIDAY: Mushroom Soup; Liver w/onions; Deviled Crabs; Roast Beef w/dressing; Seafood Platter; Tuna & Noodle Casserole (Special); Whipped Potatoes; Peas; Cauliflower.

### Week of July 31

MONDAY: French Onion Soup; Beef Chop Suey; Polish Sausage; German Potato Salad; Breaded Veal Cutlet (Special); Okra & Tomato; Green Peas. Standard Daily Items: Roast Beef; Baked Ham; Fried Chicken; Fried Fish; Chopped Sirloin; Selection of Salads, Sandwiches and Pies.

TUESDAY: Split Pea Soup; Shrimp Creole; Salisbury Steak; 8 oz T-Bone Steak; Fried Chicken (Special); Mixed Vegetables; Beets.

WEDNESDAY: Vegetable Soup; Fried Catfish w/hush puppies; Braised Beef Ribs; BBQ Plate; Weiners & Beans; Shrimp Salad; Stuffed Bell Pepper (Special); Corn O'Brian; Italian Green Beans; Rice.

THURSDAY: Chicken Noodle Soup; Beef Stroganoff; Turkey & dressing; BBQ Smoked Link (Special); Lima Beans; Buttered Squash; Spanish Rice.

FRIDAY: Clam Chowder N.E.; Broiled Flounder; Liver w/onions; Seafood Platter; Fried Shrimp; Meat Sauce & Spaghetti (Special); Green Beans; Buttered Broccoli; Whipped Potatoes.

# 32 Employees Receive Service Awards

A number of center employees were recently awarded length-of-service pins to commemorate their long-standing employment by the government. Dr. Christopher Kraft, center director, presented the award and certificate to the individuals.

Receiving thirty-five-year pins were: Eugene K. Wendler, Crew Systems Division; Lewis R. Fisher, Orbiter Project Engineering Office; Nickolas Jevas, Spacecraft Design Division; Jack Funk,

Mission Planning and Analysis Division; Thomas A. Dorrrough, Jr., Ground Data Systems Division; George J. Mallios, Logistics Division; Clarence Meyers, Management Services Division; and Hailey M. Bishop, Life Sciences Experiments Division.

Receiving thirty-year pins were: Dorothy E. Newberry, Institutional Procurement Division; Howard W. Osborne, Control Systems Development Division; John H. F. Fornegay, Avionics Systems Engineering Division; John H. Kimzey, and James

A Parker, Structures and Mechanics Division; W. Augustus Bower, Logistics Division; Everett D. Shafer, Management Services Division; Robert E. Thrower, Engineering Division; and Richard S. Johnson, Director, Space and Life Sciences Directorate.

Receiving twenty-five-year pins were: Jack Fuller, Institutional Procurement Division; Henry M. Forstner, Financial Management Division; Gordon M. Ferguson, Crew Training and Procedures

Division; Bill M. Blunck and Ray F. Irwin, Experiment Systems Division; William E. Cox, Flight Simulation Division; Dorothy H. Starnes and John J. Thornton, Logistics Division; Donald G. Morris, Murry D. Norman, and Boyce E. Sterling, Technical Services Division; Sonnie W. Porter and Stanley R. Spaeth, Engineering Division; Madalyn Krevosky, Shuttle Program Office; and Richard D. Bratton, Earth Observations Division.

Our congratulation and appreciation to these dedicated employees.



R. E. Johnston



R. D. Bratton



E. D. Shafer



C. Meyers



B. E. Sterling



M. D. Norman



D. H. Starnes



S. R. Spaeth



S. W. Porter



R. E. Thrower



D. G. Morris



G. Ferguson



E. K. Wendler



R. F. Irwin



L. R. Fisher



J. G. Kimsey



N. Jevas



W. E. Cox



J. Funk



T. A. Dorrrough



G. J. Mallios

## Roundup Swap Shop

### Cars & Trucks

1970 Karmann Ghia, good body, good tires, excellent mechanical cond. (10K miles since complete overhaul), \$900. Bob White, 482-7529

Goodyear CR 70-13 w/ raised white letters, never used. \$45 or best offer. Charrier, X-4393

1974 Luv Pickup with custom camper top, excl. cond. \$1,900. 554-6765 after 5 p.m.

1967 Chev Impala, 9-pass. Sta. Wgn., auto trans., P steering, original owner. 994-4581

1973 Ford Torino, new trans., good tire, very low mileage, excl. cond. Mary, X-5181 or 488-0768 after 5 p.m.

1971 VW Bus, 54,000 miles, new mich rad tires, AC, Lt. batt., elec fuel pump, good cond., \$1,500. Gary P. Meister, 554-6173 after 5:30 p.m.

Credit Union repos., subject to prior sale: 1977 Subaru, \$2,500; 1977 Datsun, \$3,800; 1973 Opel. Call collection dept. 488-7070

1975 Oldsmobile Regency 98, 4-door hardtop, all power, tilt-wheel, stereo, air, P steering, P brakes, air shocks, cruise control, \$4,250. Johnson, 488-5010

Tires: 5 each used G78-15 Goodyear, custom power cushion, polyglas, belted, whitewall and 1 new G78-15 B.F. Goodrich, silvertown, belted, polyester-fiberglass cord, blackwall, all for \$50. Lewis H. Lee 538-1025

Captains chair pedestals for 1977 E-150 Ford Van, driver & passenger side, \$20 each. G. T. Bauch, 333-3382

1969 Dodge Coronet, V-8, air, burns no oil, \$300. Bridge, X-4735 or 482-4272 aft 3

1977 Chrysler Cordoba, white w/ blue vinyl top, loaded, excl. cond., below wholesale. Roy Cox, 488-5263, 8:30 - 5 p.m. weekdays

1975 Subaru, 17,000 miles, auto, 4-door, vinyl top, very economical with front wheel drive, must sell, \$1,975. Hammack, 334-2986

### Cycles

1974 Suzuki, 250 GT street bike, excl. cond. C. R. Murdock, 481-1469 after 6 p.m.

### Boats & Planes

CAL-25 Sailboat, fully equipped for racing or cruising, \$7,500. Sampsel, 334-1278

1977 17-foot Ebbtide Captiva, 150 HP Mercury, Tilt/trim, speedometer/tachometer, stainless steel prop, 17-LR sportsman trailer, MINT cond., \$5,000. Johnson, 488-5010

14-foot fiberglass fishing boat, 5 HP outboard motor, \$650. 482-7546

### Pets

Horse for sale: Mare, 8 yrs., 14.5 hands, excl. health, best offer. Eggleston, 482-4239

Doberman pups, 10 wks, excl bloodlines, black & rust, \$100. Turner, 921-0025 or 944-7221

### Musical Instruments

Spinet piano for sale, Janssn (mfg), 15 yrs old, solid mahogany with damper and mother, excl. cond., \$400. Lyn Amann, X-5376 or Ames 780-1121

Wurlitzer spinet piano, \$450. Bernard J. Mieszkuc, 333-4669

Upright piano, \$250. Beverly X-2517 or 332-6763 after 5 p.m.

### Stereo/Camera

Heathkit GR-900 color TV, \$150 or best offer. Sears 19" color TV for parts, free. Tex Ward, 488-5445

Bearcat 210 Scanner with memory, \$225 firm. Burt, 333-2117

### Late Entries

Disposing mint postage at discount. 3% off for 15-cent and 5% off for 13-cent. \$10 minimum. Sugano X-7428 or 482-5393

For Sale: 1974 Cadillac 4-dr sedan, \$3500. Ashley, 332-2080 after 6 p.m.

1965 Dodge Pickup/6 engine. Probably good for parts only, \$100. Ashley, 332-2080 after 6 p.m.

Swap Shop advertising is open to JSC federal and on-site contractor employees. Goods or services must be offered as advertised, without regard to race, religion, sex or national origin. Non-commercial personal ads should be about 20 words and include home phone number. Typed or printed ad copy must be received by AP3/Roundup by Wednesday of the week prior to publication.

Two Doberman female pups, born 5/13/78. Registered. \$125. Ashley, 332-2080 after 6 p.m.

Lease: CLC, New Baywind 2-bdrm Condo, Refrig, dishwasher, 2-bath, W&D connections, fireplace, private patio, pools, saunas, exercise & game rooms, clubhouse. Becker, 994-5118 or X-5276

1973 Honda 450, Wixom Fairing, very clean, \$650. Phone 334-2294

Ford van seat, 4-person, \$25; Trombone-King Tempo, good beginner instr., \$90; Trombone-Conn 88H, F-trigger, exc. cond., \$300; Skateboard-Bonzai (with extra parts), \$20; Sailboat-homemade, 10 ft long, 4 ft wide, Sunfish sail, ready to go, good cond., \$140; Sailboat center board-plate (steel) 3/8 inches thick, 54 inches long, 14 inches down to 9 inches wide, pivot point and wench, \$20. Miller, X-4507 or 471-4390

1975 Lincoln Continental 4-dr. AC, PW, P, seats, AM/FM stereo w/ tape T. wheel, 37,000 miles. 488-1326 after 5 p.m.

1976 Subaru GF-sport purchased Oct. 76, 37,000 miles, exc. cond. 5-speed, FM stereo, Tach. Quartz clock, new mats, 26 mpg in town with AC, avg retail, \$3,300 sell for \$2,775. Whitecotton, X-4086 or 333-5204

### Property & Rentals

Wooded waterfront lot at Point Lookout on Lake Livingston, 75 by 137, utilities, restriction, boat launch, fishing pier, \$4,000. John Richardson, X-4691

Rent: Lake Livingston cottage on water at Nugents Cove, unfurnished \$35 weekend, \$76 week. J. W. Kalk, X-4207 or 554-6093

Lease: 2 bdrm, 1 bath townhome, large decked area, 2-car carport, washer, dryer, pool. Available mid Aug., \$325/month plus elec. 482-5237 after 5 p.m.

6 Years Equity Free. 2 lots Lake Livingston for what I owe on 10-year load & main. fees. T. M. Ward, 488-5445

Cape Conroe, 2 townhouse lots, sec. 1, blk. 1, priced below market. 488-3319 after 5 p.m.

Rent: Lakeside vacation retreat at Cape Royale on Lake Livingston, new 3 bdrm waterfront home, compl furn. Facil include tennis, pool, golf, boat launch. Rent by wk or mo. 488-3746

For Sale: Wooded lot, 76 by 145, sportsman retreat, Lake Livingston. Water electricity, phone service, restrictions. Lewis H. Lee, 538-1025

Galveston West End 2 bd by-the-sea condo, full furn. \$180 wk off season \$260 wk in season. Clements, 474-2622

### Household Articles

For Sale: 5-piece silver service, beautiful Cherbrough design, Cost \$550, sell for \$400. Sam H. Nassiff, 482-7546

For Sale: 5-foot Heywood Wakefield maple Early American sofa with beige cushions. \$85. Golf lounge chair in gd cond., \$25. Maple end table, \$5. W. M. Anderson, 482-1617

### Wanted

Wanted to buy: Computer Vidio Terminal and acoustic coupler. Jim Bates, 483-4601 or 944-4687

Wanted: Ladies who are interested in Contract Bridge Players Pool. Contact Ginger Lizza, 332-3153 after 6:30 p.m.

Need ride from Houston to JSC from 7:30 to 4:00 until Sept. 1. X-5159 or 659-5011

### Miscellaneous

"Fawn" brand vending machines: 1 candy & gum; 1 cigarette, cost \$1000. Sacrifice \$500 each. Timing light \$150 value for \$95. Blackwell, 474-4209

5 HP Outboard, 1947, \$20; 10 power binoculars, \$25; Weaver rifle scope, \$30. Tex Ward, 488-5445

Tennis Racquet, aluminum Spalding Smasher 4-1/2, light, orig. \$37 now \$20, good cond. Stephen Jacobs, 777-2173

(Continued on page 2)

# Chinese space science activity pushed

(Continued from page 1)

stars, and photometry of stars. Some of the men brought reprints for me of their articles in *Scientia Sinica*, in English, and one (Dr. Hu Wen-Rui) exhibited his copy of one of my publications on double galaxies. I soon found that the Chinese are well acquainted with western

copy to Peking.)

They are delighted to have the book, reports, pamphlets, and photos I presented to them, particularly the NASA photos of Shuttle, Skylab in orbit, and ALSEP instruments deployed on the Moon. They spoke about the large

(ton) meteorite that fell near that old town in 1976. The display included the two large pieces (3 or 4 feet in dimensions), dozens of fist-sized fragments, and hundreds of smaller pieces, down to one-half-inch or less. A map showed the locations of these finds, and the determination of the meteor's flight path. There were tables of its chemical composition, and charts relating it to interplanetary space flight.

from grasping power in the future. (The four members of the Gang are under house arrest, being "re-educated.")

## Alphabet Stressed

China's present leaders intend to industrialize the country, mechanize agriculture, and teach all young Chinese "Pin-Yang", a replacement of written Chinese characters by Latin-letter transliterations. The national budget is carefully balanced, there are no long-term loans or credit cards, and no inflation.

The yuan is a stable currency, but very few citizens of the People's Republic get to use it overseas. In fact, the average citizen seems to know very little about the outside world, except that the Russians are bad, and the "capitalist-imperialist" countries of America and Europe are exploiting the "Third World." China considers itself a member of the Third World, but this may change with the coming industrialization and a developing Chinese space program, backed by 800 million people.



THE ULTRAVIOLET camera is shown here being placed into operation by John Young on the Apollo 16 mission. Dr. Page was principal investigator for this experiment which produced strikingly beautiful as well as scientifically important views of the Earth, and other space objects.

science, and are working on advanced analyses of scientific data. Most of their data are western because Chinese astronomical instruments are of limited quality and size.

## UV Camera Discussed

I gave short talks describing our S201 Far-UV Camera used for astronomical photographs from the Moon, emphasizing the "Far-UV Atlas of the Large Magellanic Cloud" soon to be published as an NRL Report. In each meeting, about half of the Chinese seemed able to understand my English and did not need the interpreter. They asked questions, mainly about instruments, and also about such western scientists as Herb Friedman and George Carruthers at NRL, Karl Henize at JSC, Fastie at JHU, and Lin at MIT. I asked whether they had any trouble getting scientific publications from the west, and learned that their libraries are well stocked, although the Peking Observatory had missed one Catalog published by the U.S. Naval Observatory. (At my request, the Naval Observatory has sent an extra

telescope under construction in Nanking, and their own telescope planned for a mountain site some 30 miles NE of Peking. Drs. Pan How-Ren and Wu Jian-Cheng at the Institute of Space Physics are calibrating x-ray and far-UV detectors for use on a satellite, but they could not tell me when it will fly. I was told that a major change in national policy on science has taken place during the past year since "Gang of Four" were removed from power. Chairman Hua has given high priority to science and technology, and set the goal of doubling the number of scientists and technicians in China by 1982. This includes astronomy and space science, but none of the scientists I met was involved in teaching, and none of our other visits to universities and high schools in Manchuria or Shanghai revealed classroom instruction in these subjects. Unfortunately, I was not able to visit Nanking, which seems to be the center of astronomical learning.

Our three-week tour took us to see many other sights, several of which were related to space science. At a museum in Kirin, Manchuria, we saw the large (2-

## Politics Mix

At an evening dance show in Shanghai, where the theatre was filled with over 1000 comrades, there was a spectacular modern dance by a man who carried a gleaming rocket. He played with it a minute or two, then it suddenly left his hands, pulled off stage. Disappointed, the young space scientist danced for another minute, then mounted a high ladder and struck a pose like the Statue of Liberty, with one arm up. Out of the wings came the gleaming rocket, which he caught in his raised hand, as the audience clapped and cheered. I suspect this symbolism may have represented a disappointing interval in 1975-77 when the "Gang of Four" held back space science in China.

Other visits took us to modern factories, agricultural communes, a cinema studio, glass works, art school, nursery schools, the Great Wall, the Forbidden City, and the Memorial to Chairman Mao, who has become a sort of god to the Chinese. His preserved body is on view to people who, as a reward for outstanding work in their factories or communes, come from all over the People's Republic to see their remarkable leader. We were told that Mao eliminated the class barrier between peasants and the rest of Chinese society, that he started the public planting of trees along roads, rivers, canals and in the mountains to replace the timber cut during the imperial era. He encouraged the arts, sciences, general education of the masses, and population control (two children per family). Just before his death, he recognized the political machinations of his wife and three politicians, coining the phrase "Gang of Four." In Shanghai, I got a book in English describing how the Gang was thrown from power by the State Council, and including a revised Constitution of the People's Republic (adopted by the People's Congress on March 5, 1978), which is intended to prevent such people



THIS IS THE EARTH in far ultraviolet light. The photo is an enhanced product taken with the Naval Research Lab far UV camera on the Apollo 16 mission. Note the earth airglow on the dark side of the earth. This light comes from excited molecular nitrogen and atomic oxygen. Chinese space scientists were impressed by Dr. Page's work in this area.

## Twinkle, Twinkle, Little Star, Up Above the Earth So Far . . .

Nine years ago, yesterday, two Americans, representing Earth, stepped foot for the first time on another planet. Apollo 11 had landed safely on the surface of Earth's Moon, ending forever man's dominion over only one planet in his solar system. In subsequent years 10 other men landed on the Moon and continued to return scientific treasures.

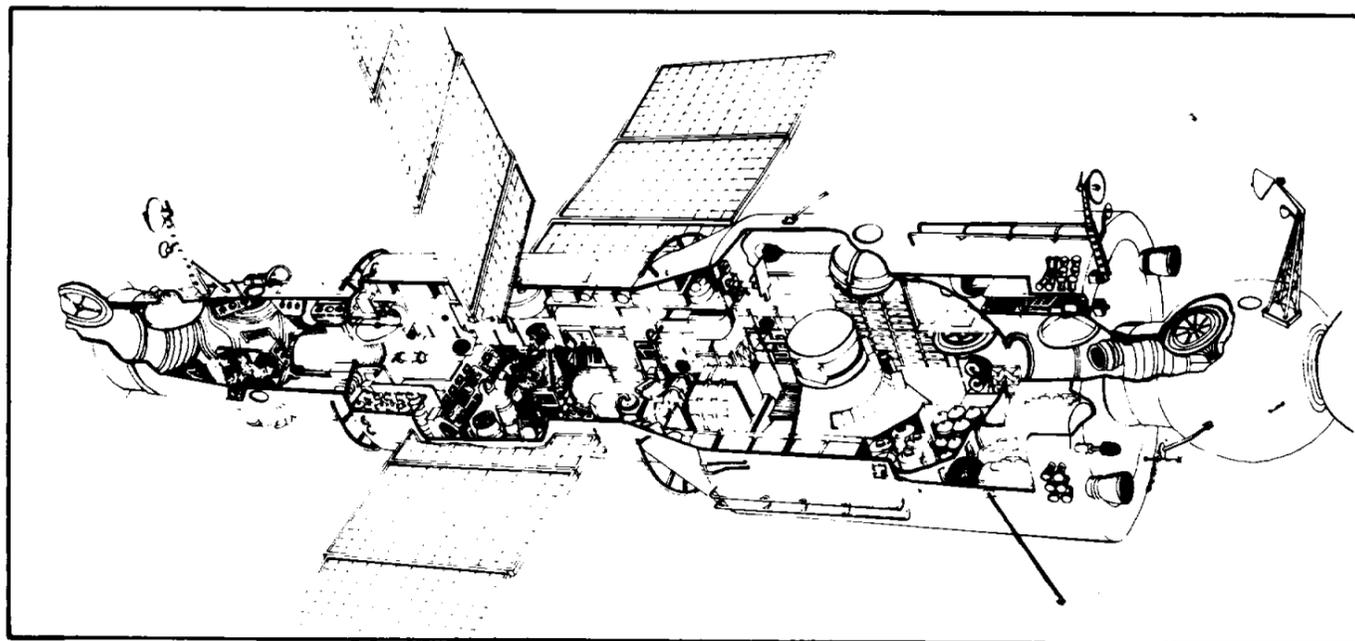
As a result of those missions we have learned a great deal about our dual planet system—the Earth-Moon. These missions were followed by even more probes, unmanned, which sped through space to their encounters with Mercury, Venus, Mars, Jupiter and beyond.

Late this year man will attempt again to land a spacecraft on the hostile surface of Venus. We will approach the closest encounter ever with Jupiter in spring and early summer of next year with the two Voyager spacecraft. Those craft will continue on, after surveying Jupiter and its moons, to encounter Saturn, and if all continues well, on to Uranus, and Neptune.

We have recently discovered that Pluto is not a single body, but has a moon. Mercury is no longer the smallest planet. That meager distinction now goes to Pluto, which, with its moon, had long been thought of as the second-smallest planet.

The space telescope will be launched in the 1980's and will extend our frontier out hundreds of millions of light years—perhaps to the origin of time.

How long ago July 20, 1969, now appears to have been.



OF MEN AND MACHINES: THE OTHER SIDE. This is the Salyut space station operated by the U.S.S.R. This drawing originally appeared in the Soviet magazine *Aviation & Cosmonautics*, March, 1978. The vehicle is a little over 49 feet in length and weighs 8454 pounds. The Salyut is divided into four stations: The airlock module (on extreme left); the operations module (with solar wings attached); the experiment module (the largest compartment); and the propulsion module (on the far right shown attached to a Soyuz). The airlock module contains the forward docking port, the EVA hatch and suits, thermal radiators, compressed air tanks, and some solar sensor equipment. The operations module contains electronic equipment and operating consoles for certain gear, the environmental control system, drinking water, vacuum storage tanks, a

mechanism for changing the orientation of the solar wings, and an earth sighting device. The experiment module contains a cosmonaut weighing device, sleeping bags, waste disposal airlock, dust filter, personal hygiene devices, toilet, food stowage, power and control equipment for scientific gear, and two interesting sensors: the six film-can-like objects in the forward end are multispectral cameras and the conical object right behind them is an infrared telescope. The propulsion module contains the orientation and stabilization engines (which appear as quads and units of six each), the orbital maneuvering engines, fuel tanks for the engines, and the major supply tank for the vehicle's environmental control system. There are docking antennas at both ends of the station and hatches at both ends as well as between the airlock module and the operations module.